



Aalborg Universitet

AALBORG UNIVERSITY  
DENMARK

## The emerging land management paradigm

*a major challenge for the global surveying community*

Enemark, Stig

*Publication date:*  
2005

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*

Enemark, S. (2005). *The emerging land management paradigm: a major challenge for the global surveying community*. The Royal Institution of Chartered Surveyors.  
<http://www.rics.org/Environmentalandlandconsultancy/Geomatics/stig.html>

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

### Take down policy

If you believe that this document breaches copyright please contact us at [vbn@aub.aau.dk](mailto:vbn@aub.aau.dk) providing details, and we will remove access to the work immediately and investigate your claim.

RICS EVENING LECTURE SERIES  
RICS, LONDON, 8 DECEMBER 2005

## The Emerging Land Management Paradigm - A Major Challenge for to Global Surveying Community

Professor Stig Enemark  
Vice-president of FIG  
Department of Development and Planning  
Aalborg University, Denmark  
Email: [enemark@land.aau.dk](mailto:enemark@land.aau.dk)

### SUMMARY

Land management is the process by which the resources of land are put into good effect. Land management encompasses all activities associated with the management of land that are required to achieve sustainable development. The concept of land includes properties and natural resources and thereby encompasses the total natural and built environment. Land Administration Systems (LAS) are institutional frameworks complicated by the tasks they must perform, by national cultural, political and judicial settings, and by technology. This paper facilitates an overall understanding of the land management paradigm.

The model reflects drivers of globalisation and technology development which support establishment of multifunctional information systems incorporating diverse land rights, land use regulations and other useful data. A third major driver, sustainable development, stimulates demands for comprehensive information about environmental conditions in combination with other land related data. It is argued that development of such a model is important or even necessary for facilitating a holistic approach to the management of land as the key asset of any nation or jurisdiction.

Finally, the paper points at some educational, professional and institutional challenges to be faced by the land administration community in the third millennium. And the paper identifies the role of FIG in this regard.

## **INTRODUCTION**

Land administration systems are increasingly being tested against an emerging vision of a more unified model appropriate for developed economies but also capable of providing direction for transitional economies.

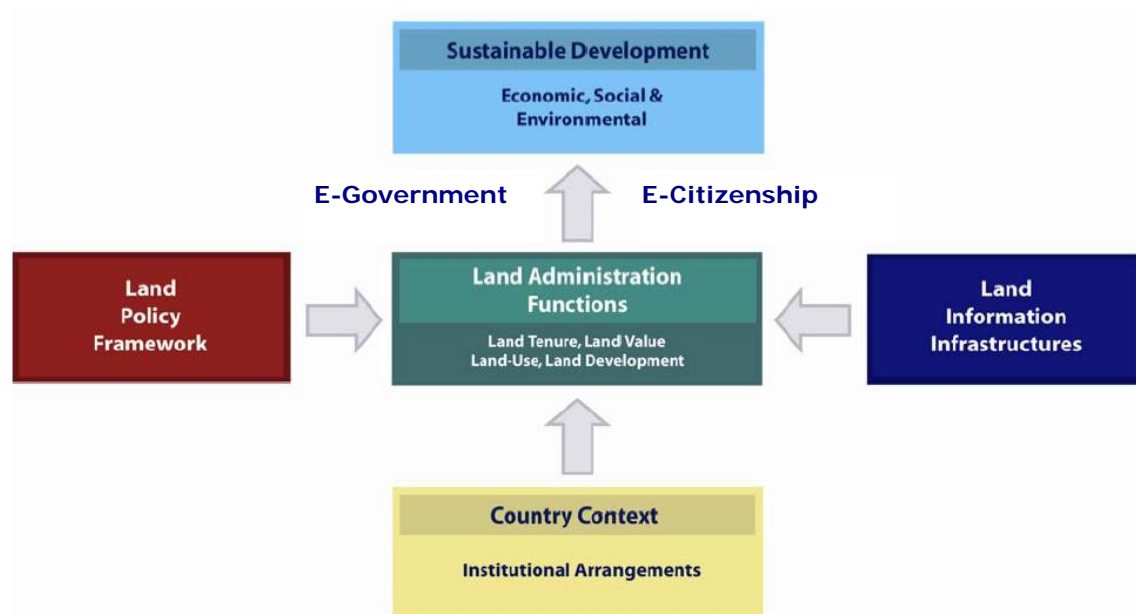
The new vision builds on the model developed by Dale and McLaughlin (1999) but concentrates on functions and systems delivery, in contrast to their comprehensive analysis of existing systems with a focus on land information management. The basic understanding of dealing with Land rights, land value, and land use is the same, but the new vision is based on a holistic approach to LAS that aims to perform stated functions through delivery arrangements and systems. It develops holistic analysis of the functional relationship between the infrastructure of the LAS and the policy of sustainable development; it recognises land management as the policy imperative; and it parallels the development of a theory for spatial data infrastructures and demands for spatially specific information about government and private activities.

The model is based on the key understanding of land administration as an area dealing with rights, restrictions and responsibilities in land. This relates to the interaction of the three areas of land tenure, land value and land use. By including land development these four areas are called the Land Administration Functions. These functions are based on policies determining the overall objectives and they are managed on the basis of appropriate land information infrastructures providing complete and up to date information on the natural and built environment. This all sits within a country/state context of institutional arrangements that may change over time. The model is explained in more details below.

## **THE LAND MANAGEMENT PARADIGM**

Land management is the process by which the resources of land are put into good effect (UN-ECE 1996). Land management encompasses all activities associated with the management of land and natural resources that are required to achieve sustainable development. The concept of land includes properties and natural resources and thereby encompasses the total natural and built environment.

The organisational structures for land management differ widely between countries and regions throughout the world, and reflect local cultural and judicial settings. The institutional arrangements may change over time to better support the implementation of land policies and good governance. Within this country context, the land management activities may be described by the three components: Land Policies, Land Information Infrastructures, and Land Administration Functions in support of Sustainable Development. This Land Management Paradigm is presented in Figure 1 below (Enemark et al., 2005):



*Figure 1. The Land Management Paradigm*

Land policy is part of the national policy on promoting objectives including economic development, social justice and equity, and political stability. Land policies may be associated with: security of tenure; land markets (particularly land transactions and access to credit); real property taxation; sustainable management and control of land use, natural resources and the environment; the provision of land for the poor, ethnic minorities and women; and measures to prevent land speculation and to manage land disputes.

The operational component of the land management paradigm is the range of land administration functions that ensure proper management of rights, restrictions, responsibilities and risks in relation to property, land and natural resources. These functions include the areas of land tenure (securing and transferring rights in land and natural resources); land value (valuation and taxation of land and properties); land use (planning and control of the use of land and natural resources); and land development (implementing utilities, infrastructure and construction planning).

The land administration functions are based on and are facilitated by appropriate land information infrastructures that include cadastral and topographic datasets and provide access to complete and up-to-date information about the built and natural environment.

Sound land management is the operational processes of implementing land policies in comprehensive and sustainable ways. In many countries, however, there is a tendency to separate land tenure rights from land use rights. There is then no effective institutional mechanism for linking planning and land use controls with land values and the operation

of the land market. These problems are often compounded by poor administrative and management procedures that fail to deliver required services. Investment in new technology will only go a small way towards solving a much deeper problem; the failure to treat land and its resources as a coherent whole.

Modern LAS in developed economies should facilitate sustainable development - the triple bottom line of economic, social and environmental sustainability - through public participation and informed and accountable government decision-making in relation to the built and natural environments. The interface between the LA infrastructure and professions and the public will increasingly be serviced by information communication technologies designed to implement e-government and e-citizenship. These processes will be used to link systems and information to people who would then be involved in delivering sustainable development at the local level (Ting 2002). E-citizenship is mobilisation of society to engage in planning, use and allocation of resources, using technology to facilitate participatory democracy. E-government involves a government putting government information and processes on-line, and using digital systems to assist public access. E-governance is e-democracy – helping to govern society through the use of the Web.

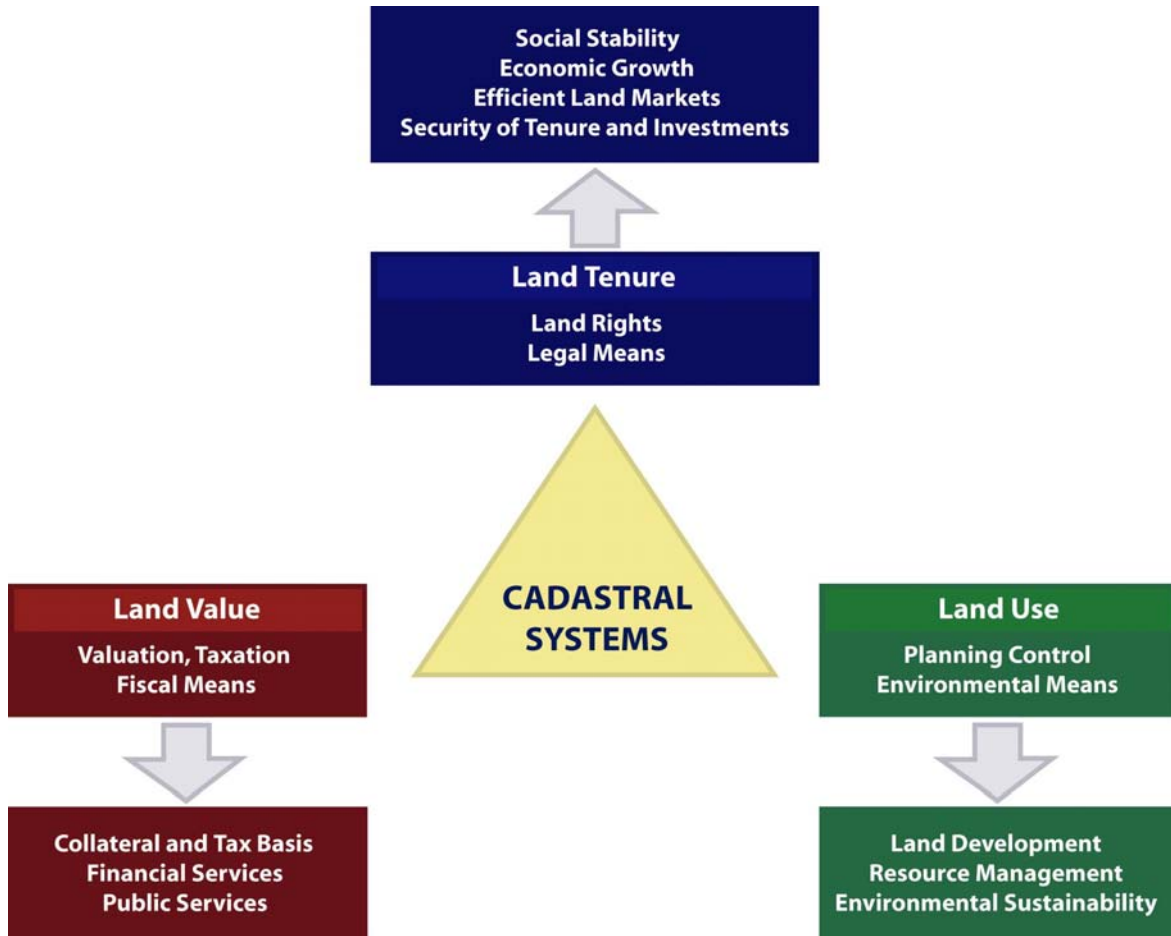
## **CADASTRAL SYSTEMS**

The basic building block in any land administration system is the land parcel as identified in the cadastre. The International Federation of Surveyors (FIG 1995) defined a cadastre as “a parcel based, and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (e.g. valuation and equitable taxation), legal purposes (conveyancing), to assist in the management of land and land use (e.g. for planning and other administrative purposes), and enables sustainable development and environmental protection”.

However, the concept of “cadastre” is difficult to identify. It may be designed in many different ways, depending on the origin, history and cultural development of the country or jurisdiction. Basically, a cadastre is just a record that identifies the individual land parcels/properties. The purpose of this identification may be taxation (as was the original reason for establishing the European cadastres) or it may be security of land rights (as was the case in Australia). Today, most cadastral registers around the world are linked to both land valuation/taxation and to the securing of legal rights in land.

Therefore it makes sense to talk about cadastral systems or cadastral infrastructures rather than just a cadastre. These systems or infrastructures include the interaction between the identification of land parcels, the registration of land rights, the valuation and taxation of

land and property, and the present and possible future use of land. The role and purpose of cadastral systems is shown in Figure 2 below.



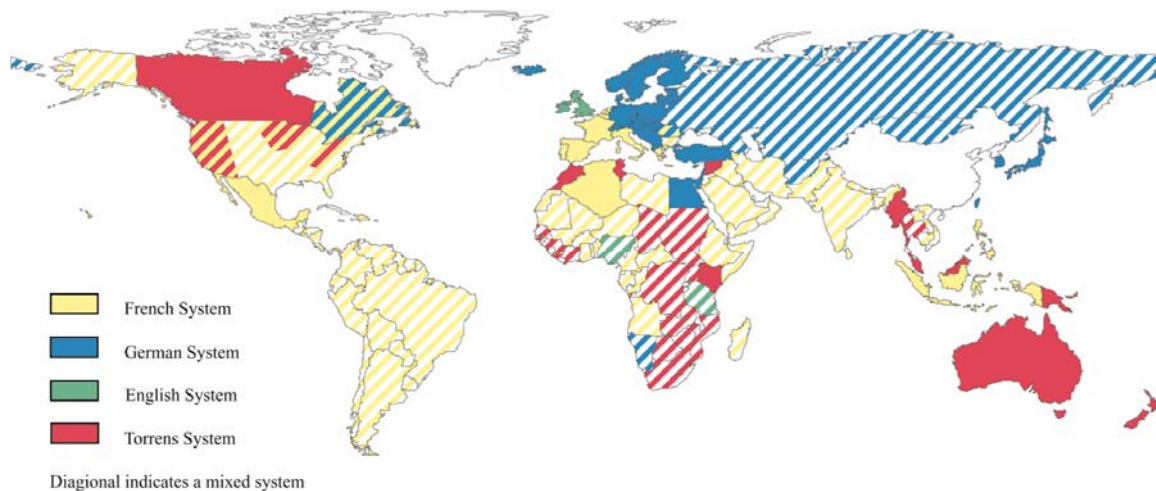
*Figure 2. Cadastral systems facilitate administration of three main areas:  
Land Tenure, Land Value and Land Use.*

Throughout the world different organisations of cadastral systems are apparent, especially with regard to the land registration component. Basically, two types of systems can be identified: the deeds system and the title system. The differences between the two concepts relate to the extent of involvement of the state, and to the cultural development and judicial setting of the country. The key difference is found in whether only the transaction is recorded (deeds systems) or the title itself is recorded and secured (title systems). Deeds systems provide a register of owners focusing on “who owns what” while title systems register properties presenting “what is owned by whom”. The cultural and

judicial aspects relate to whether a country is based on Roman law (deeds systems) or Germanic or common-Anglo law (title systems). This of course also relates to the history of colonization.

Deeds registration is rooted in Roman culture and is, therefore, common in Latin cultures in Europe (France, Spain, Italy, Benelux), in South America, and parts of Asia and Africa which were influenced by these cultures. The concept is also used in most of the United States. Deeds systems are found in different forms, with significant variations in the role of cadastral identification and surveyors.

Title registration originated in the German culture and is found in central European countries (Germany, Austria, Switzerland). Different versions of the German system are found in Eastern European and Nordic countries. The various versions relate to the use of the property concept and the organization of the cadastral process including the use and the role of private licensed surveyors. A special version of the title system is found in UK, where the concept of general boundaries is used to identify the land parcels on the large-scale topographic map series. A third variant, based on the original German concept (Raff 2003), is found in the Torrens system introduced in Australia during the mid 1800's to serve the need of securing land rights in the New World.



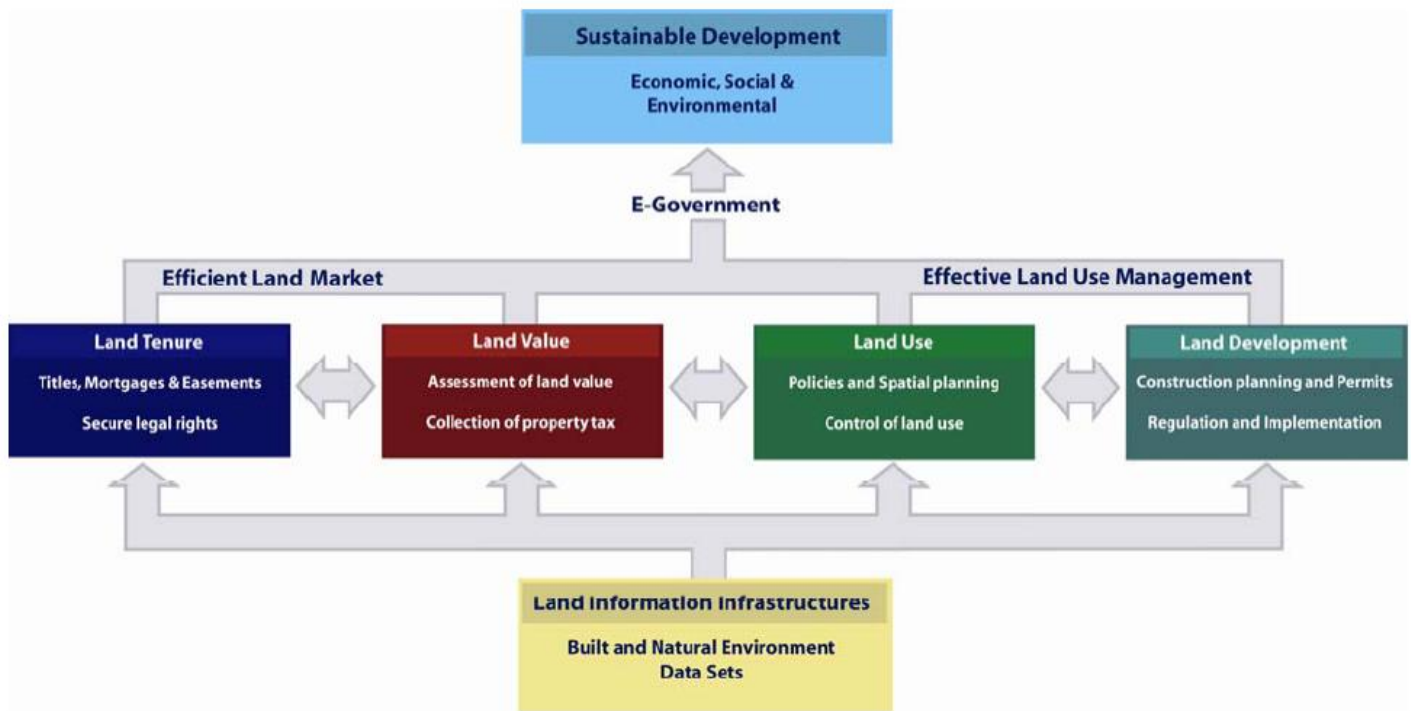
*Figure 3. General overview of land registration systems throughout the world (view in colors).*

Even though cadastral systems around the world are clearly different in terms of structure, processes and actors, their design is increasingly influenced by globalisation and technology towards multipurpose cadastres (van der Molen 2003). The same influences push land rights and land use towards integrated, multifunctional information systems. Modern cadastres and land information systems also reflect urbanisation and micro-economic reform incorporating decentralisation, privatisation and quality assurance. The

most significant driver is sustainable development with its demand for comprehensive information on the environmental conditions in combination with other land and property related data. As a result, the traditional surveying, mapping and land registration focus has moved away from being primarily provider-driven to now being clearly user-driven. The success of a cadastral system is a function of how well it internalises these influences and achieves these broad social, economic and environmental objectives.

## LAND ADMINISTRATION SYSTEMS

LAS, and particularly their core cadastral components, are important infrastructure, which facilitate the implementation of land policies in both developed and developing countries. LAS are concerned with the social, legal, economic and technical framework within which land managers and administrators must operate (UNECE 1996). These systems support efficient land markets and are, at the same time, concerned with the administration of land as a natural resource to ensure its sustainable development. This global approach to modern land administration systems is shown in Figure 3 below.



*Figure 3. A Global Land Management Perspective*



As described above, land administration comprises an extensive range of systems and processes to manage:

- **Land Tenure:** the allocation and security of rights in lands; the legal surveys to determine parcel boundaries; the transfer of property or use from one party to another through sale or lease; and the management and adjudication of doubts and disputes regarding rights and parcel boundaries.
- **Land Value:** the assessment of the value of land and properties; the gathering of revenues through taxation; and the management and adjudication of land valuation and taxation disputes.
- **Land Use:** the control of land use through adoption of planning policies and land use regulations at national, regional and local levels; the enforcement of land use regulations; and the management and adjudication of land use conflicts.
- **Land Development:** the building of new physical infrastructure; the implementation of construction planning and change of land use through planning permission and granting of permits.

These systems are interrelated. The actual economic and physical use of land and properties influence land value. Land value is also influenced by the possible future use of land as determined through zoning, land use planning regulations and permit granting processes. And the land use planning and policies will, of course, determine and regulate future land development.

The information on land and properties permeates through the system and provides the basic infrastructure for running the interrelated systems within the four interrelated areas. The land information area should be organised to combine cadastral and topographic data and thereby link the built environment (including legal land rights) with the natural environment (including environmental and natural resource issues). Land information should, this way, be organised as a spatial data infrastructure at national, regional/federal and local level based on relevant policies for data sharing, cost recovery, access to data, standards, etc.

The design of adequate systems in the area of land tenure and land value should lead to the establishment of an efficient land market capable of supporting trading in complex commodities. The design of adequate systems in the areas of land use control and land development should lead to effective land-use management. The combination of an efficient land market and effective land-use management should then form the basis for a sustainable approach to economic, social and environmental development.

A modern Land Administration System acts within the environment of adopted land policies that fulfill political objectives with regard to land issues. It also acts within an institutional framework that imposes mandates and responsibilities on the various agencies and organisations. The system is concerned with providing detailed information at the individual land parcel level. It should service the needs of both the individual and the

community at large. Benefits arise through its application in guaranteeing of ownership, security of tenure and credit; facilitating efficient land transfers and land markets; supporting management of assets; and providing basic information in processes of physical planning, land development and environmental control. The system, this way, acts as a backbone for society.

These ambitious goals will not be achieved unless there is a commitment to designing and implementing effective land administration infrastructures. These may be described as the organisations, standards, processes, information and dissemination systems and technologies required to support the allocation, transfer, dealing and use of land (UN-FIG 1999). Information and communications technology (ICT) will play an increasingly important role both in constructing the necessary infrastructure and in providing effective citizen access to information. Also, there must be a total commitment to the maintenance and upgrading of the land administration infrastructure.

## INTEGRATED LAND-USE MANAGEMENT

An integrated system of Land-Use Management for Sustainable Development is shown in figure 5 below:

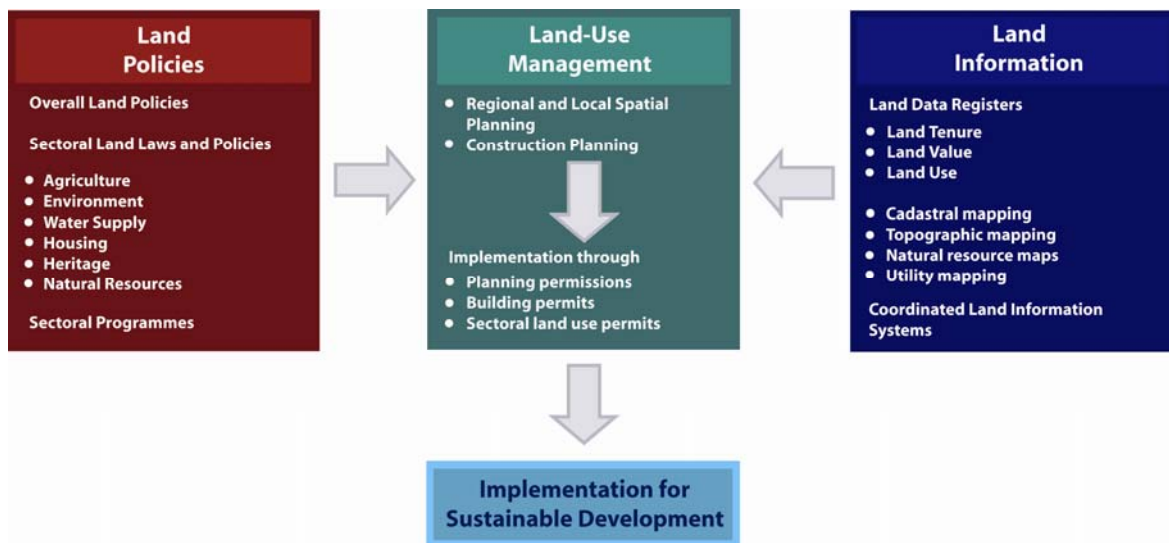


Figure 5. Integrated Land-Use Management for Sustainable Development (Enemark, 2004).

Integrated land-use management is based on land policies laid down in the overall land policy laws such as the Cadastral/Land Registration Act; and The Planning/Building Act. These laws identify the institutional principles and procedures for the areas of land and property registration, land-use planning, and land development. More specific land policies

are laid down in the sectoral land laws within areas such as Agriculture, Forestry, Housing, Natural Resources, Environmental Protection, Water supply, Heritage, etc. These laws identify the objectives within the various areas and the institutional arrangement to achieve these objectives through permit procedures etc. The various areas produce sectoral programmes that include the collection of relevant information for decision making within each area. These programmes feed into the comprehensive spatial planning carried out at national/state, regional and local level.

Furthermore, the system of comprehensive planning control is based on appropriate and updated Land Use Data Systems, such as the Cadastral Register, the Land Book, the Property Valuation Register, the Building and Dwelling Register, etc. These registers are organized to form a network of integrated subsystems connected to the cadastral and topographic maps to form a spatial information infrastructure on the natural and built environment.

In the Land-Use Management System the various sectoral interests are balanced against the overall development objectives for a given location and thereby form the basis for regulation of future land-use through planning permissions, building permits and sectoral land use permits according to the various land-use laws. These decisions are based on the relevant land use data and thereby reflect the spatial consequences for the land as the people. In principle it can then be ensured that implementation will happen in support of sustainable development.

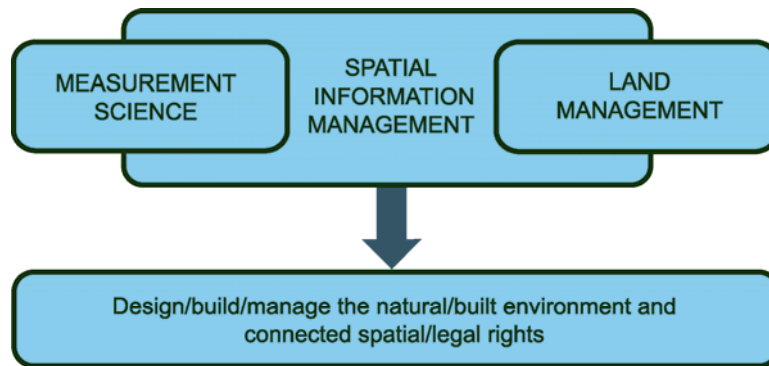
## **CAPACITY DEVELOPMENT**

Good land management will help promote economic and social development in both urban and rural areas. For developing and transition countries, land reform policies are key components in achieving these goals. The challenges in this regard relates to developing the necessary capacity in terms educational, professional, and institutional standards. These challenges are further explored below.

### **The Educational Challenge**

Traditional education of surveyors has focused on geometry and technology more than on land use and land administration. Taking a land administration approach to surveying education, there is a need to change the focus from being seen very much as an engineering discipline. There is a need for a more managerial and interdisciplinary focus as a basis for developing and running adequate systems of land administration.

A future educational profile for land administrators should be composed by the areas of Measurement Science and Land Management and supported by and embedding in a broad interdisciplinary paradigm of Spatial Information Management. Such a profile is illustrated below (CLGE/FIG , 2000).



#### *THE EDUCATIONAL PROFILE OF THE FUTURE*

### **The Professional Challenge**

The spatial information revolution and the evolving land management paradigm in support of sustainable development have had many influences on professional structures over the last two decades. Professions such as surveying are being re-engineered and re-invented to accommodate the spatial information revolution, while endeavouring to maintain traditional services.

The international surveying profession and the national associations will have to adapt to these challenges and develop structures that accommodate a modern interdisciplinary profile. This includes adoption of ethical principles and model codes of professional conduct suitable for performing this modern role (FIG 1998).

The profile of the surveying profession in the third millennium will include a mix of technical surveying and mapping professionals, business practitioners, spatial data managers, land and environmental resource managers (in the public as well as the private sector), and legal and financial consultants on land management matters.

### **The Institutional Challenge**

Establishing appropriate institutional and organisational infrastructures is seen as a crucial key for achieving sustainability in any society. In a theoretical sense, the concept of property rights is such an institution. Appropriate cadastral systems play a most important role in terms of facilitating the real property transactions such as land transfers, land taxation and control of land-use and land development.

Another institutional challenge is about establishing a suitable balance between national policy-making and local decision-making. This challenge relates to good governance and to the issue of decentralization with regard to the delegation being made between governmental levels. Decentralization of land-use planning and decision-making

immediately raise the question of suitable local institutions and organisations for managing these tasks. Such local institutions and organisations must be able to handle conflicts in a very concrete and direct sense. In the context of sustainability, the conflict between immediate gains and needs on one hand, and the concern of future generations on the other, is of course crucial.

A fundamental institutional challenge in this regard is related to understanding the value of developing appropriate institutional, legal and technical processes to integrate land administration and topographic mapping programs within the context of a wider national land policy.

The Land management activities rely on some form of land administration infrastructure that permits the complex range of rights, restrictions and responsibilities in land to be identified, mapped and managed as a basis for policy implementation.

Institutional development in Land Management implies adoption of long-term strategic actions and capacity building activities. This includes the need to:

- Develop in-country self assessment procedures to identify the capacity needs and thereby argue for establishing the necessary measures of capacity development in terms of policies, legal framework, institutional infrastructures, and human resources and skills.
- Promote the creation and adoption of a comprehensive policy on land development and establish a holistic approach to land management that combines the land administration/cadastral/land registration function with the topographic mapping function
- Establish a clear split of duties and responsibilities between national and local government (decentralisation). Ensure that the principles of good governance apply when dealing with rights, regulations and responsibilities with regard to land resources and land development.
- Promote the understanding of land management as highly interdisciplinary that includes a whole range of policy measures such as social, economic, environmental, judicial, and organisational.
- Promote the need for an interdisciplinary approach to ‘surveying education’ that combines both technical and social science and thereby links the areas of measurement science and land management through a strong emphasis on spatial information management.
- Establish strong professional bodies such as a national institution of surveyors who are responsible for the development and control of professional standards and ethics, enhancement of professional competence, and interaction with governmental agencies to develop the optimal conditions and services.
- Promote the need for CPD to maintain and develop professional skills and promote the interaction between education, research and professional practice.

Adoption of a comprehensive policy on land management is crucial since this will drive the legislative reform which in turn results in institutional reform and finally implementation with all its technical and human resource requirements.

## **THE ROLE OF FIG**

FIG can support the process of building capacity for sustainable land management in three ways:

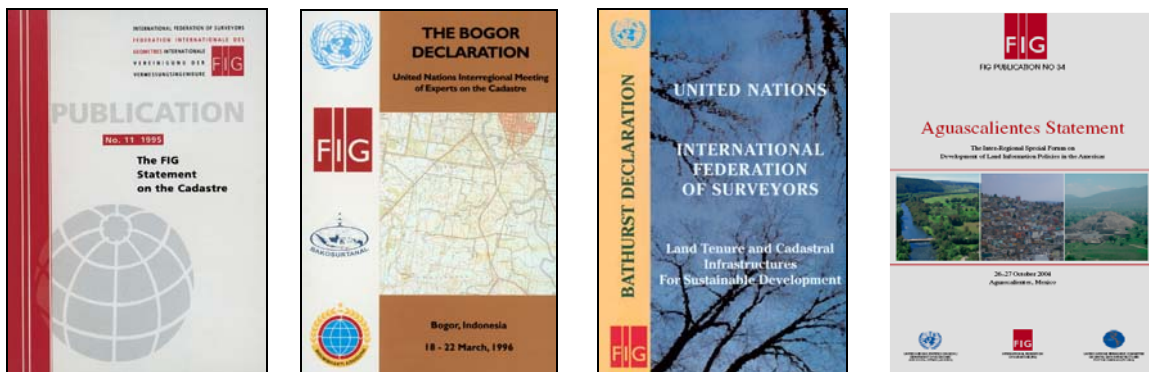
- **Professional development**  
FIG provides a global forum for discussion and exchange of experiences and new developments between member countries and between individual professionals in the broad areas of surveying and mapping, spatial information management, and land management. This relates to the FIG annual conferences, the FIG regional conferences, and the work of the ten technical commissions within their working groups and commission seminars. This global forum offers opportunities to take part in the development of many aspects of surveying practice and the various disciplines including ethics, standards, education and training, and a whole range of professional areas.
- **Institutional development**  
FIG provides institutional support to individual member countries or regions with regard to developing the basic capacity in terms of educational programs and professional organisations. The educational basis must include programs at minimum Bachelor level that include the combination of surveying and mapping, Spatial Information management, and Land Management. Such programs combine the land administration/cadastral/land registration function with the topographic mapping function within a holistic land management perspective. The professional organisations must include the basic mechanisms for professional development including standards, ethics and professional code of conduct for serving the clients.
- **Global development**  
FIG provides a global forum for institutional development through cooperation with international NGO's such as the United Nations Agencies (UNEP, FAO, HABITAT), the World Bank, and sister organisations (IAG, ICA, IHO, and ISPRS). The cooperation includes a whole range of activities such as joint projects (e.g. Bathurst, Aguascalientes), and joint policy making e.g. through round tables. This should lead to joint efforts of addressing topical issues on the international political agenda, such as reduction of poverty and enforcement of sustainable development.

The three means of development are of course interrelated and interdependent. Professional development requires that both a professional organization and an educational basis are in place. Institutional development in terms of mature public agencies and policies requires a solid professional and educational base in order to establish a holistic and sustainable approach to land management based on principles of good governance and an adequate balance between the activities of the public and private

sector. And global development of course requires mature NGO's with a strong professional base.

FIG, this way, plays a strong role in improving the capacity to design, build, and manage land administration systems which incorporate spatial data infrastructures.

Throughout the last 10-15 years FIG has taken a lead role in explaining the importance of sound land administration systems as a basis for achieving “the triple bottom line” in terms of economic, social and environmental sustainability. International organizations such as UN, FAO, HABITAT and especially the World Bank have been key actors in this process. A number of these key publications are shown below.



Furthermore, the FIG publication Series also includes a number of publications addressing educational, professional, and institutional issues of global relevance, such as Continuing Professional Development, Ethical Principles, and Business Matters for Professionals, Standardisation, and Mutual Recognition of Professional Qualifications. The publications are available on-line at the FIG Home Page <http://www.fig.net/pub/figpub/pubindex.htm>

## FINAL REMARKS

The objective of this paper is to build an overall understanding of the Land Management Paradigm and the need for institutional development to establish sustainable national concepts in this area. This includes creation and adoption of a comprehensive policy on land development, and a holistic approach to land management that combines the land administration/cadastral/land registration function with the topographic mapping function

The debate should be aware of the global trends in this area while still recognising that the design of such systems will always be unique due to the different geographic and cultural preconditions and needs of each respective country. This calls for increased international co-operation. FIG is prepared to invest in such corporative efforts.

## REFERENCES

- CLGE/FIG (2000): Enhancing Professional Competence of Surveyors in Europe. Proceeding of the CLGE/FIG conference held at Delft University of Technology, November 2000. <http://www.fig.net/pub/CLGE-FIG-delft/report-1.htm>
- Dale, P. and McLaughlin, J. D. (1999): Land Administration. Oxford University Press.
- Enemark, S. (2004): Building Land Information Policies. Proceedings of Special Forum on Building Land Information Policies in the Americas. Aguascalientes, Mexico, 26-27 October 2004. [http://www.fig.net/pub/mexico/papers\\_eng/ts2\\_enemark\\_eng.pdf](http://www.fig.net/pub/mexico/papers_eng/ts2_enemark_eng.pdf)
- Enemark, S., Williamson, I., and Wallace, J. (2005): Building Modern Land Administration Systems in Developed Economies. Accepted for publication in the Journal of Spatial Science, Australia in the December Issue 2005.
- FIG (1995): The FIG Statement on the Cadastre. FIG Publication Series No. 11. The Surveyors House, Copenhagen. [http://www.fig7.org.uk/publications/cadastre/statement\\_on\\_cadastre.html](http://www.fig7.org.uk/publications/cadastre/statement_on_cadastre.html)
- FIG (1998 ): Statement on ethical principles and Model Code of Professional Conduct: FIG Publication Series No. 17. The Surveyors House, Copenhagen. <http://www.fig.net/pub/figpub/pub17/figpub17.htm>
- Ting, L. (2002): Principles for an Integrated land Administration to Support Sustainable Development, PhD Thesis, Department of Geomatics,
- UN-ECE (1996): Land Administration Guidelines, Geneva.
- UN-FIG-PCIDEA (2005): Aguascalientes Statement – The Interregional Special Forum on Development of Land Information Policies in the Americas. FIG Publication Series No 34, FIG Office, Copenhagen. <http://www.fig.net/pub/figpub/pub34/figpub34.htm>
- van der Molen, Paul, 2003, The Future Cadastres – Cadastres after 2014, FIG Working Week, 2003, 13-17 April, Paris France, 42 pp. <http://www.eurocadastre.org/pdf/vandermolen2.pdf>

## BIOGRAPHICAL NOTES

**Stig Enemark** is Professor in Land Management and Problem Based Learning at Aalborg University, Denmark, where he was Head of the School of Surveying and Planning 1991-2005. He is Master of Science in Surveying, Planning and Land Management and he obtained his license for cadastral surveying in 1970. He worked for ten years as a consultant surveyor in private practice. He is currently the President of the Danish Association of Chartered Surveyors and he is Vice-President of the International Federation of Surveyors (FIG) 2005-2008. He was Chairman of FIG Commission 2 (Professional Education) 1994-98, and he is an Honorary Member of FIG. He was acting as the Danish delegate to the Council of European Geodetic Surveyors (CLGE) 1997-2005. His teaching and research are concerned with land administration systems, land management and spatial planning, and related educational and capacity building activities. Another research area is within Problem Based Learning and the interaction between education, research and professional practice. He has undertaken consultancies for the World Bank and the European Union especially in Eastern Europe and Sub Saharan Africa. He has more than 200 publications to his credit, and he has presented invited papers to more than 50 international conferences. For further information see <http://www.land.aau.dk/~enemark>



## CONTACTS

Professor Stig Enemark  
Department of Development and Planning  
Aalborg University, 11 Fibigerstrede  
DK 9220 Aalborg, Denmark  
Tel +45 9635 8344; Fax +45 9815 6541  
Email: [enemark@land.aau.dk](mailto:enemark@land.aau.dk)  
Web: [www.land.aau.dk/~enemark](http://www.land.aau.dk/~enemark)